

Pass Laboratories

Aleph 4 Service Manual

Rev 0 8/18/1997

Aleph 4 Service Manual.

The Aleph 4 is a stereo 100 watt audio power amplifier which operates in single-ended class A mode.

The Aleph 4 has only two gain stages which are biased by current sources. Because of the inherent simplicity of the circuit, it is easy to understand and repair. There are no adjustments.

Figure 1 shows the simplified schematic of the amplifier. Two p channel Mosfets form an input differential pair biased by a current source operating at about 20 ma. The drain of the input Mosfet is attached to the gate of an n channel power Mosfet which forms the active output stage. It is biased by a current source at slightly greater than 3 amps.

The voltage rails of the supply are at 48 volts, and each channel draws approximately 250 watts.

Fig. 2 and 3 show the actual schematic for the amplifier.

F1 is a slow blow fuse, set at 8 amps for 100-120 volt operation, and 4 amps for 220-240 volt operation.

S1 is the power switch, which has two sets of 25 amp contacts wired in parallel.

T1 is a thermostatic switch rated at 75 degrees Centigrade. It is mounted to the rear heat sink.

TH2 is a power thermistor used to connect the circuit and chassis ground to the AC outlet ground. It will normally operate at 5 ohms, suppressing ground loops in the system, but will drop to a low impedance if significant current is passed through it.

TH1 and TH3 are power thermistors (Keystone CL-60) which are used to suppress inrush current.

The power transformer drives a high current bridge and 100,000 uF of capacitance to form a plus and minus 48 volt supply.

Referring to the channel itself, Q1A1 and Q1A2 form the differential input pair of Mosfets. They are biased by the current source formed by Q1A5. Q1A5 is biased to about 20 ma by the reference Zener diode Z9 which sets about 5 volts across R11.

Z1, 2, 7 and 8 protect the input from static spikes. R5, R14-18 and R53 form the input networks and feedback loops.

The output of the differential input pair drives the gates of output devices Q18-29. These parallel devices are matched gate to source voltages as close as .01 volts, however variations as high as .1 volts will not impede operation.

The voltage across R24 shows the drive voltage for the output stage, and it should have 4-5 volts across it.

The output of the amplifier is taken from the drains of Q18-20. Q18-20 are provided a bias current by the current source circuitry of Q6-8, also a matched set of n channel Mosfets.

Q6-8 are set at 3 amps DC by the network consisting of Q3 and the components surrounding it. Q3 is biased by R25 and R27 in series. A capacitor C8 is used to reduce supply noise. R28 serves to sense the current running through Q6, and feeds that to the base of Q3, forming a loop that holds the output current at 3 amps. The pn junction drop of Q3 forms the reference voltage for the system.

R26 is a fixed resistor which trims the DC current value. R29 and C9 adjust the current against output current as sensed by the voltage across R42-46 and R52.

Fig. 4 and 5 show the component layout of the central circuit board. This board holds the power supply components, the front end circuitry, and connects the power stages together.

On this diagram you can see the wiring arrangements for the various AC line voltages: 100-120, and 220-240 volts.

There are no adjustments to the amplifier. Values for biasing various components are taken from physical constants, such as pn junctions and zener voltages, and through matching of Mosfet transistors.

The input Mosfets are match V_{gs} to within .01 volts, and the output Mosfets are in matched pairs within .1 volt, although production tolerance is typically .01 volt.

For a 120 volts AC line, the amplifier will draw about 4 amps RMS. If you measure current draw with an averaging meter, you will get a smaller number.

The amplifier is designed so that the heat sinks will operate approximately 30 degrees C. above ambient, for a typical temperature of 55 degrees C. Temperature protection occurs at 75 degrees C.

The amplifier will not be damaged by driving a short circuit, and it is probable that the only failures you will see will be random component failure.

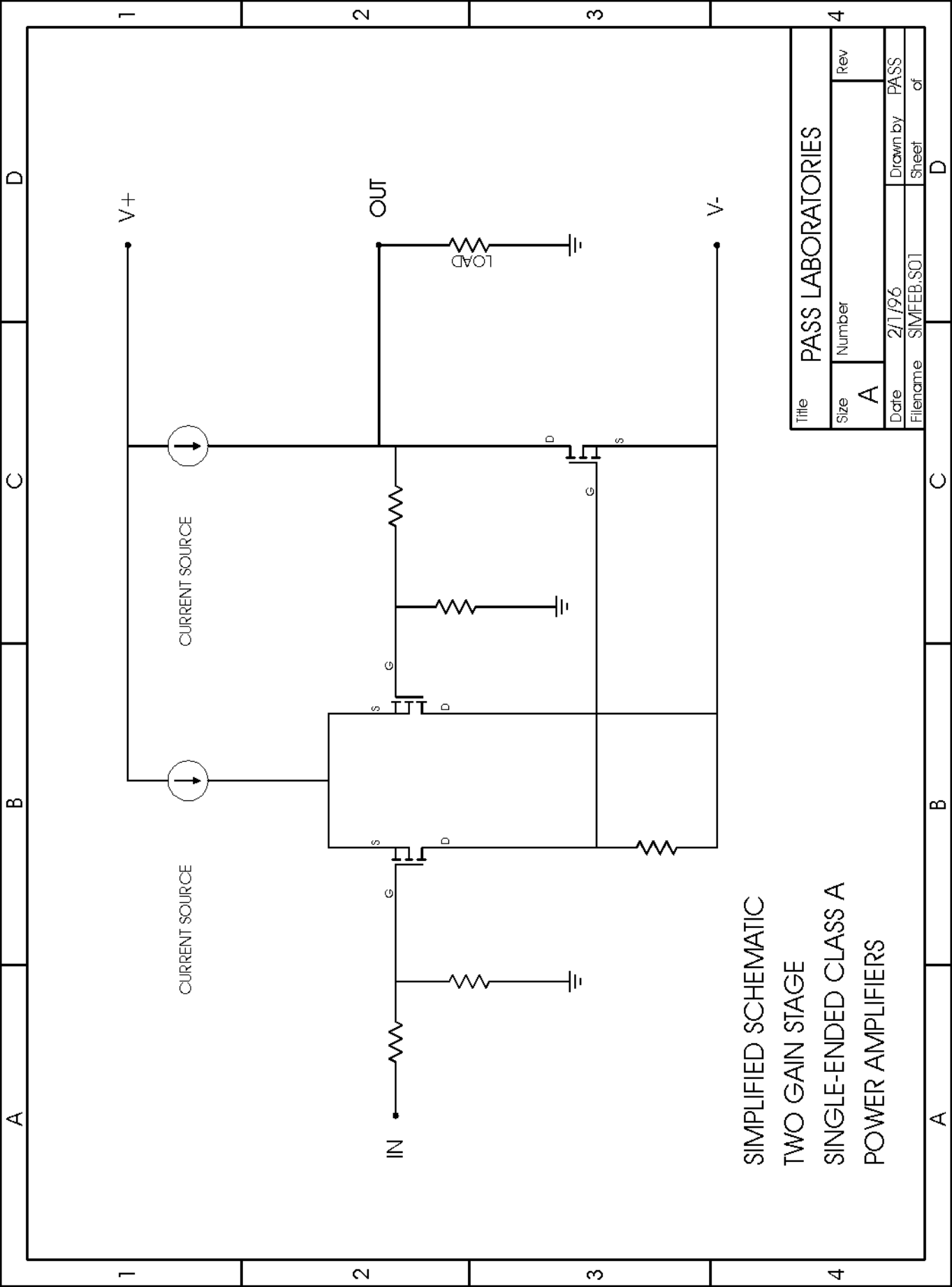
SPECIFICATIONS

Gain	20 dB balanced
Freq. Response	- 3 dB at 0.3 Hz, -3 dB at 100 KHz
Power Output	100 watts/ch 8 ohms
Distortion (1KHz)	<1%THD
Output Impedance	0.1ohm
Input Impedance	10 Kohm unbalanced 25 Kohm differential
Input CMRR	> -50 dB Typical
Power Consumption	500 watts
Dimensions	16 " W x 16" D x 10.5" H
Shipping Weight	105 lb.



Pass Laboratories
PO Box 219
24449 Foresthill Rd.
Foresthill CA 95631

tel (916) 367 3690
fax (916) 367 2193



SIMPLIFIED SCHEMATIC
 TWO GAIN STAGE
 SINGLE-ENDED CLASS A
 POWER AMPLIFIERS

Title			
PASS LABORATORIES			
Size	Number	Rev	
A			
Date	Filename	Drawn by	Sheet of
2/1/96	SIMFEB.S01	PASS	

